VI. INDUSTRY REVIEW

Advisory Committees

Two advisory committees were formed. the Production and Marketing, and Scientific and Quality committees. These committees met twice during the project. Summaries of the input recieved and the advisory committee membership follow.

Advisory Committee Summary (sent out 7/2/86)

The Scientific and Quality Advisory Committee met June 11, 1986 in Anchorage. Attending were all committee members and Bill Wasson of Bering Sea Fishermen's Association.

As expected, many people are interested in working on various aspects of the pink salmon problem. Topics to be addressed and people probably covering them are as follows:

1. Literature search - Don Kramer and Chuck Crapo to survey the existing literature for information specific to salmon or other oily Pacific coast species on rancidity control, packaging, and functional characteristic changes in freezing and storage with explanatory notes. An ASH disk would be available with this file for a nominal fee.

2. Functional characteristics and rancidity control - evaluation of sexual maturity, handling, and packaging on rancidity development and functional characteristics (as measured by thaw drip).

   - Chuck Crapo (with AFDF involvement

3. Formulation and color - Peyton will evaluate additives such as serum, mince, washed mince, and carrogeenan for texture modification, binding characteristics, flaking, shelf life.

4. Microbiological work - Elisa Elliot and Jong Lee to evaluate micro loads on incoming fish, at various processing steps, in final products and will isolate sources of any pathogens.

The production and marketing committee met in Seattle. Members attending are noted on the membership list. Additional interested observers were Linda McGowan of Deep Sea Fisheries, and Sharon Gwinn of First Surimi, Inc., and, formerly, of AFDF.

Discussion centered on the relative cost of producing non-IQF frozen boneless skinless products for reforming as opposed to the likely sale price. Bill Woods provided the following comparison table to evaluate pink salmon fillets and blocks in comparison to other competing products.

	IQF, b/s	Block	Mince
Cod	$1.60	$1.35	$0.65
Pollock	1.10	0.75	0.40
Halibut	3.70	4.25	
Salmon	H&G	Fillet	Steak
red	2.40	4.00	3.50
chum	1.20	3.10	2.20
pink	0.90	2.00	0.80 (mince)
		1.80-2.25 skin on, bone in	

Several observations were made:

- Reformed boneless, skinless products are covered, detracting from the selling ability of salmon's visual appeal.
- With existing technology, it is very difficult to produce an attractive natural fillet with the pin bones removed, so is this actually an alternative?
- Pin-bone-in product is limited in market and is not attractive to the national food companies and institutional and food service operators for whom the reformed product is an option.

In conclusion, the opinion of the marketing segment was that bulk pack, boneless, deep skinned pink salmon logs could probably be sold at around $2.25/lb.

The market potential for mince was also examined. In comparison to other minces, its market value could be expected at around $0.80/lb. Initial market reaction to production was enthusiastic and price ideas were considerably higher, in the $1.25 range. This may be explained in part by the different sources from which the mince was derived -- whitefish operations mince trim, collars, belly and other lower quality cuts, while the pink mince was primarily pin-bone trim (center of the loin) and soft fillets. A conscious effort was made to keep the pink mince very clean and high quality due to potential rancidity problems. A reasonable midpoint, assuming less meticulous grading of material, vacuum packaging, higher oil content and lower overall quality might be $1.00.

The vacuum stuffed log concept was developed in response to rancidity and cost of packing concerns. Mince addition to the fillet logs was generally accepted though caution was expressed concerning the percentages. The idea received favorable reviews from the scientific committee and potential users if it would indeed solve the storage stability problem. Possible complications were pointed out, however -- metal clips cannot be used to tie the ends of the casings due to microwave tempering, and the logs need to be sawed in half (e.g., 16.5 lb/2, etc..) for some applications.

Concerns were also expressed that some effort should be expended on evaluating market potential in food service and institutional markets for products in addition to working with national food companies. Clearly, a fillet with the pin bones pulled, rather than cut, would be an interesting product to test. Another valuable piece of information would be evaluation of price levels for reformed products marketed directly by seafood producers. Custom forming, vacuum packing and breading services are available in Seattle and the possibility of doing some independent market research on formed fillets is being considered. Product would probably be produced from both logs and frozen fish slacked out and reprocessed in Seattle after the season to evaluate the differences between once and twice frozen fish.

Concern was also expressed that using only once frozen fish would not be a realistic test as few plants are equipped to fillet in season. It was pointed out that there are at least seven shore-based fillet lines in Alaska now capable of producing pink fillet products in season. Each is capable of 1.0 to 1.5 million lb. for a total of 10 million lb. Some are dedicated to canned production, but there are also many floating processors. Someone producing cod during the winter could process salmon, and someone canning salmon could produce frozen fillets from fresh in summer or frozen fish during the winter. In short, there are ample opportunities to produce either once or twice frozen fillets.

Excerpts from Advisory Committee Letter (September 30, 1986)

The summer's activities got underway in Kodiak ln late July, with AFDF, NMFS, FITC and Office of Commercial Fisheries Development (OCFD) cooperating on the design and sample preparation for a series of interconnected experiments.

Kodiak Experimental Runs

Approximately 2,000 pounds of round fresh pinks from Alaska Fresh Seafoods were dressed, and half were frozen for later reprocessing. The remainder were filleted and the pin bone section removed using a V-cut. Blocks of fillets, blocks of fillets with mince added at 25% and 50%, and mince blocks were prepared. Tests will be run to determine chemical and sensory changes in blocks held at 0° compared to blocks held at -30°, and to compare once frozen product to that produced from frozen h&g fish reprocessed at a later date.

Tests will be run comparing deep and shallow skinned samples, comparing vacuum packaging and poly bagging, and comparing different antioxidants. While the exact number of determinations to be run on the various sale sets hadn't been determined, there will be at least TBA's, thaw drips, and organoleptic tests run on each sample set at three month intervals. In addition, free fatty acids, total polar oxidation products, proximate analysis, oil and water contents, and PH' will be run as needed and as time allows.

Experimental and Production Runs at Seafoods from Alaska

The week at Seafoods was spent running yield tests using a skilled fillet crew and putting up vacuum extruded logs using a Vemag extruder. I bought 1,200 pounds of mince and fillet logs, and sent samples back to Kodiak for evaluation and storage life tests with the remainder going to Seattle for test marketing.

While there we determined the optimum diameter casing, choosing a 6.5" flat width as the best compromise. This will mimic one-half a 16.5 lb. fish block while also yielding a 4-8 oz. steak of suitable thickness (1/4-1/2") at 8.25 or 10 lb. net weight.

We also tried several mince and salt addition rates to determine their effect on texture. Mince additions of 0, 15, and 30% with 0, 0.5, and 1.0% salt were evaluated by an informal taste panel. The Seafoods staff felt that the all fillet product was clearly superior in texture, but that the mince didn't affect taste particularly. The salt level did affect texture, but, as for taste, it was a matter of personal preference. There was a difference of opinion as to the amount of mince to use, with one preferring to use as much mince as possible, the other preferring the all fillet product.

Chuck and I preferred the 15% mince with 0.5% salt to achieve the best economics and binding without sacrificing quality too much. At this level both the salt and mince are detectable, but neither should detract from texture or appeal to low salt users. We decided to run a larger test batch at NPP using the ribbon blender as opposed to the paddle blender at Seafoods, as the coating of mince on the fillets and elimination of obvious mince pockets should be superior.

Production Runs at North Pacific Processors

There were some experimental aspects to the production runs in Cordova. These included comparison of mince produced using a perforated drum debonair of 5mm hole size and a deboner/strainer which produces a much finer texture. Another was the the difference in binding ability and voids between logs produced using a vacuum extruder such as the Vemag and a piston pump such as used at NPP. Also of interest was the degree of protein activation and breakage associated with the ribbon mixer.

Qualitative observations are that neither the Vemag nor the ribbon mixer caused substantial breakage and that the combination of the ribbon mixer and the piston pump produced a fillet log that bound comparably to the vacuum extruded product with no voids in either product. The capacities and costs of the two systems are not comparable, however, as the NPP unit has 2-3 times the capacity at about three times the price.

Fillets were produced on a Badder 195, a machine several companies have used to produce salmon fillets, but which gives lower yields than the current state of the art 184. The Baader Model 50 Skinner was inserted into the line, and the pin bones were removed using a top cut. The top cut and fillets were placed on separate moving belts and the fillets stockpiled until their turn through the stuffer. Top cuts and belly flaps were minced using both a Bibun perforated drum deboner and a Beehive deboner/strainer. Alternately, mince and fillets were packaged, sometimes using the mixer and other times loading the product directly to the screw conveyor feeding the pump hopper.

A 4" diameter horn with a foot activated cut-off valve was used which fitted the rest of the line well, but the horn size proved overlarge for easy control of the casing. A standard clipper was used to secure the end of the casing after patching to target weight. Obviously, having a portioner on the pump would have made even weights easier and more efficient to achieve.

Several problems associated with the production set-up became obvious, but due to space and time constraints could not be addressed. These centered on lack of space for trimming and inspection.

Due to the late and concentrated run, the crew trained to produce bone-in prduct for canning was very tired, and training the crew to produce bone out product proved difficult. Finding graders capable of spotting errant pin bones also proved difficult. The defect rate were marginally acceptable most of the time, worse at the start and better at the finish. Space was not available for the number of trimmers required to do the top cut unless the other fillet lines were shut down. This turned out to be a major problem the first day, but the second there was not enough fish to run more than one line anyway.

The largest unresolved problem is the high bacterial counts. According to preliminary work done at the FITC, nearly all the samples have TPC over 100,000 (for the 25° test), The high bacterial counts are probably due to slow movement of the product, repeated handling, and inadequate time/temperature control. These problems could be addressed through revising the line layout and providing a chilled space to work in, but this was not feasible on a one day run.

Total coliforms were generally in excess of the reprocessing industry standard maximum of 100. High coliform counts probably indicate inadequate equipment sanitation and have been observed in other operations using automated filleting and skinning equipment. Inadequate cleaning allows the hardier coliforms to become the dominant culture which contaminates later fish. The coliform species identified are not in themselves health risks, but do indicate a problem. Fecals were generally quite low, indicating that the contamination is probably not of human origin. Unfortunately, the bacterial information was not available until after the run was completed due to the length of time required to transport the samples and conduct the tests.

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North Pacific Processors Final Report by Harmon Blanch
Pink Salmon Fillet and Mince Log Production

Background:

The State of Alaska, through the Department of Commerce and Economic Development, proposed a pilot project to produce pink salmon in the form of frozen logs. The pilot had two objectives. The first was to determine if a salmon log, made from either fillets or mince, could be produced economically. The second was to produce enough product for a test market. If the project proved to be successful, the new product could utilize the abundance of Alaska pink salmon in non-traditional markets.

Since North Pacific Processors had the equipment to produce the fish logs and the projected Prince William Sound pink salmon run indicated that there would be an abundance of fish, we requested to participate in the program.

As we are now well aware, the projected pink salmon run did not materialize. The pilot project was rescheduled on two occasions, hoping the run was only late. Finally, in the latter part of the season, the decision was made to go ahead and over a two day period, the fish logs were produced.

Although the volume of fish was not as great as expected, the quality was good. The fish which were used to produce the logs were of the same quality as those which went into the Hormel skinless/boneless canned salmon pack.

The final report from North Pacific Processors Inc. covering cost accounting, fish quality specifications, processing methods and machinery, sanitation and general discussion of the problems experienced during, follows. The economic feasibility and a minimum price necessary to produce the fillet and mince salmon logs will be determined by the corporate office after marketing information has been reviewed.

FISH QUALITY

The first days' production utilized seine caught fish from Prince William Sound. The fish were brailed or rolled on board the fishing vessel and then transferred to a company tender and again at North Pacific Processors by means of a wet pump. A portion of the fish had slight to moderate bruising with some softening of the flesh. The general fish quality was typical of the catch method and time of year.

The second days production utilized aquaculture fish from the Port San Juan hatchery. Live fish were wet pumped from holding pens to a company tender and wet pumped again to the processing plant. The majority of fish were firm with only a small portion graded out due to pale flesh color. The weight range of the fish was 2 to 4 pounds with the average probably 2.8 pounds.

PROCESSING METHODS AND MACHINERY

Dressing:

A model "K" Chink, like those used for normal can salmon production, was used to head and dress the salmon.

Splitting:

A Badder 195 filleter was used to split the salmon. The model 184 may have produced better results and slightly higher yields but due to equipment layout and production flow, it was not used.

Skinning:

The skinners used for the skinless/boneless canned salmon removed the skin leaving the fat layer intact. While this is desirable for canned salmon, it apparently is a detractent from the frozen salmon logs. To overcome the problem, the skinner which was normally used was replaced with a Badder 50 deep skinner.

The Badder 50 was effective in producing an acceptable fillet but it was at the expense of product recovery. The skins produced by the Badder 50 were unusable for our other markets. Also, a usable product could not be obtained from the portion of the fish left on the skin. Without improved recovery, the price of the finished fat free logs may become prohibitive.

Pin Bone Trimming:

Some logs were produced with a higher number of pin bones than the product form should allow. While even large bones are not a problem in a canning operation, pin bones in a frozen log become a major defect since they do not "cook out".

One reason pin bones were left in the product was that they are hard to detect through rubber gloves. Another is, the staff has been trained to be recovery conscious and the generous cut required to remove the pin bone section went contrary to their previous training.

The trim from the pin bone cut was sent to a bone extractor by water flumes. Even though the fluming water was chlorinated, the increased water content

of the product and the greater surface area of the pieces undoubtedly increased the potential for bacterial growth.

If this operation were to become routine, the mince would be supplied by normally produced processing waste (belly cuts and center cuts) from the 184 and 195 Badders and the fillet trim would go directly to the skinless and boneless can line.

Mincing:

The deboning or mincing machines were not well suited for the purpose. The Bibun's pore size (5mm) was too large and allowed pieces of skin and eggs to pass through into the product. The Beehive produced a better quality product in general appearance but probably could not keep up with production.

Both units ran hot. The Bibun, due to heat transfer from the hydraulic drive and the Beehive due to motor heat and the heat generated by extruding pressure. The increased temperatures undoubtedly increased the bacterial counts along with the fluming system.

Fillet and Mince Transfer:

Three product forms were produced, 100% fillets, 100% mince and a combination of the two at a ratio of 85% fillets and 15% mince.

The products for the 100% fillet and mince logs were loaded from tubs directly into the Marlin hopper.

To produce a log of mixed mince and fillets, a ribbon blender was used. After an initial test run, it was found that the fillets and mince cannot be easily transported using a screw conveyor. Mince tends to get "lost" in the system and there is the chance of picking up pin bones from the fillets targeted for canning.

Stuffing:

A Marlin 770 stuffer was used to fill 7.5 and 6.5 in casings.

The equipment appeared to have worked well but upon slicing some of the finished product the logs were found to contain voids caused by air pockets. To reduce the air pockets, the Marlin stuffer should be fitted with a vacuum hopper.

It should be noted that there may be a disadvantage to a vacuum hopper in the canning line. If the air spaces are removed form the canned product, it may take on the appearance of a puck loosely fit into the can. This may also affect the loose texture and appearance.

Freezing:

The finished fillet logs should be frozen as soon and quickly as possible to keep the bacterial levels as low as possible. The product density and log diameter leaves a potential for warm spots in the core.

The mince production should probably take place in a cool room with a Bibun which has been modified to reduce the heat produced by the

hydraulic motor. The increased surface area, heat of the equipment and additional handling makes the product susceptible to bacterial loading.

FINISHED PRODUCT AND RECOVERY

The combined volumes of the two days production was

Fillet logs	5882 lbs
Minced logs	5246
Fillet/Mince logs	744
Total Production	11872 lbs

The recovery figures from the pilot will undoubtedly change and most likely improve as familiarity of the product increases. A rough estimation for the two days production was;

Split halves from the 195 Badder	48%
Deep skinned fillets from the 50 Badder	40%
Bone out trimmed fillets 24%	
Top cut (minced)	16%

SANITATION

The fluming system should be modified if it is used to transport food grade material. Also, it should be made to come apart for easy cleaning and inspection.

A foaming system should be installed in fillet processing area because of the high concentration of difficult to clean machinery.

A thorough cleaning should take place twice daily and wash downs using sanitizers should occur at breaks.

CONCLUSIONS

This type of production is greatly affected by pinbones and I have doubts about its feasibility without the addition of a mechanical pin bone extractor. Without an extractor, the labor costs, the loss of recovery, and high defect rate makes the product economically prohibitive to produce when compared to skinless and boneless canned salmon.

COST ACCOUNTING

	Staff	Hours	Wage	Cost	Subtotals
Fish House					
Chink hopper feeder	1	2	$8.47	$16.94	
Chink feeder	3	3.5	8.47	88.93	
Chink operator	2	3.5	9.50	66.50	
Inspector	1	3.5	8.47	29.64	$202.01
Splitting					
Belly cut for 184	3	10			
Sorter for 195	1	10	8.47	84.70	
Operator for 195	1	10	8.47	84.70	169.40
Filleting					
Operator for 50	1.5	10	8.47	127.05	
Trimmers	6	10	8.47	508.20	
Trimmers	3	5	8.47	127.05	
Inspectors	1	10	8.47	84.70	847.00
Packing and Misc.					
Handling and weighing	5	3	8.47	127.05	
Mincer	3	3.5	8.47	= 88.93	
Stuffing & packing	5	2.5	8.47	264.68	
Egg sorting	1	3.5	8.47	29.64	
Cleanup		2 6	8.47	101.64	
Badder maintenance		2 3	8.47	82.00	
Stuffer maintenance				54.00	747.94
Quality Control		1 10	8.47	84.70	84.70
Total					$2051.05